Cardiff University
School of Psychology

Studentship Title: EPSRC Doctoral Training Partnership

Research Area/Project Title: Optimal decoding of spatiotemporal patterns in Magnetoencephalography (MEG)

Location: School of Psychology

Expected Start Date: 1st October 2017

Duration: 3 Years

Deadline for Application: 1st February 2017

Description of Research Opportunity:
Magnetoencephalography (MEG) is a brain-imaging technique that measures brain activity from 200~300 sensors near the scalp with millisecond time-resolution. Recently, multivariate pattern analysis (MVPA) for brain-imaging data has been developed, which utilises machine learning methods to distinguish between brain states. MVPA takes into account associations between data dimensions, and offers superior sensitivity than conventional univariate analysis.

However, MVPA for MEG comes with a unique challenge: the high spatiotemporal dimensionality of MEG makes difficult to choose from a large variety of multivariate methods, because the optimal method depends on the underlying structure of data. This project will address this challenge, by providing the first comprehensive comparison of various MVPA approaches on whole-brain simulated and empirical MEG data.

Whole-brain simulation (years 1-2)

We will use an advanced neuroinformatic platform (www.thevirtualbrain.org) to generate computer-simulated MEG data. Simulation will be based on established neural models, prior knowledge of anatomical connections, and real noise from MEG acquisitions. The simulated data will provide a realistic testbed, of which the ground truth is known. The performance of common MVPA methods will be evaluated on this testbed, under different noise strengths and signal levels (e.g., MEG signals from within the brain or from sensors). New knowledge from this research will provide guidelines for choosing optimal MVPA methods for empirical questions.

Empirical applications (years 2-3)

Outcomes from the simulation will be validated by applying appropriate MVPA methods on two MEG datasets: (1) to distinguish MEG signals from different motor actions, and (2) to distinguish MEG signals from epileptic patients and controls. We will confirm the extent to
which the optimal methods, as indicated by the simulation-based research, outperforms other sub-optimal ones. Working on the existing datasets maximizes this project’s feasibility, and will demonstrates the full potential of MVPA in extracting information from MEG for investigating brain functions and disorders.

**Award:**

The studentships will commence in October 2017, and will cover your tuition fees (at UK/EU level) as well as a maintenance grant. In 2016-17 the maintenance grant for full-time students was £14,296 per annum. As well as tuition fees and a maintenance grant, you will receive a participant allowance of £300 per annum, and conference funding (approx. £750 per annum). You will also receive a computer and office space. You will become a member of, and have access to courses offered by the University’s Graduate College.

**Eligibility:**

Full awards (fees plus maintenance stipend) are open to UK Nationals, and EU students who can satisfy UK residency requirements. To be eligible for the full award, EU Nationals must have been in the UK for at least 3 years prior to the start of the course for which they are seeking funding, including for the purposes of full-time education.

As only one studentship is available and a very high standard of applications is typically received, the successful applicant is likely to have a very good first degree (a First or Upper Second class BSc Honours or equivalent) and/or be distinguished by having relevant research experience.

**How to apply:**

You can apply online - consideration is automatic on applying for a PhD in Psychology, with an October 2017 start date (programme code RFPDPSYA).

Please use our online application service at [www.cf.ac.uk/regis/general/applyonline/index.html](http://www.cf.ac.uk/regis/general/applyonline/index.html)

and specify in the funding section that you wish to be considered for School funding.

Please specify that you are applying for this particular project.

**Application deadline:** 1st February 2017 with interviews (either in person or by Skype) being held on or at the end of February 2017 and decisions being made by the end of April 2017.

**General Information:**

The School of Psychology is one of the largest and most successful in the UK ([http://www.cf.ac.uk/psych/](http://www.cf.ac.uk/psych/)). The School’s excellent standard of research and teaching has been recognised in every Research Assessment Exercise. It has its own brain-imaging centre ([http://www.cf.ac.uk/psych/cubric/](http://www.cf.ac.uk/psych/cubric/)), enhancing the international-leading research in behavioural neuroscience, cognitive ergonomics, forensic, social and developmental psychology.
Cardiff is the youngest capital city in Europe and the fastest growing in the UK. It plays host to many national and international sporting events at the Millennium Stadium (http://www.millenniumstadium.com/). Culturally, the city is thriving, with the Wales Millennium Centre (http://www.wmc.org.uk/) in Cardiff Bay. Cardiff is in very close proximity to the beautiful Welsh countryside (http://www.breconbeacons.org/), has a two hour rail link to London and a (cheap) one hour air link to Paris and Amsterdam (http://www.cardiffairportonline.com/)

Please address any informal enquiries to:

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